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(54) DEVICE FOR USE IN A ROLL FRAME FOR THE MANUFACTURE OF A PLASTIC FILM AND METHOD TO REPLACE A CONTINUOUS BAND

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(57) Device (1) for use in a roll frame (10) for the manufacture of a plastic film with a continuous band (2), which is looped around at least two bending rollers (3, 3'), for pressing a plastic film on a roller [or roll] (9) of the roll frame (10), where the two bending rollers (3) are rotatably attached on both sides in lateral bearing devices (5, 5') and attachment means are provided for the fixation of the bending rollers (3, 3') in one bearing device (5), with the other bearing device (5') being attached in such a manner that it can be swiveled for replacing the continuous band (2). Also, a method for replacing a continuous band (2) for pressing a plastic film on the roller (9) and for cooling it, which is looped at least around two bending rollers (3) that are rotatably attached in lateral bearing devices (5, 5'), where the bending rollers (3, 3') are fixed in a bearing device (5), the attachment means of the other bearing device (5') are loosened, and the other bearing device (5') is swiveled.

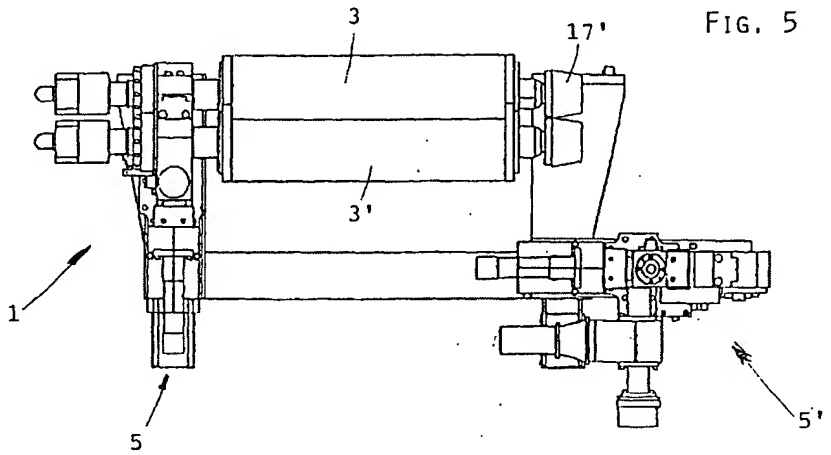

FIG. 5

Description

[0001]

The invention relates to a device for use in a roll frame for the manufacture of a plastic film, with at least one continuous band looped around at least two bending rollers for pressing the plastic film on the roller of the roll frame and to cool it, where the two bending rollers are rotatably attached on both sides in lateral bearing devices. Furthermore, the invention relates to a method for replacing a continuous band that presses a plastic film on a roller and for cooling it, where the band is looped at least around two bending rollers that are rotatably attached in lateral bearing devices.

[0002]

The continuous band, which as a rule is designed as a continuous metal band, can be used not only for the application and cooling of the plastic film, but also to transfer the surface of the continuous band to the plastic film.

[0003]

Such a device is known, for example, from US [Patent] 6 077 065 A and it is used, in particular, in smoothing installations having two cooling rollers, for the application of the plastic film introduced over a jet, because this allows the manufacture of relatively thin plastic films with a relatively smooth or structured surface, in a simple manner. As an alternative to the continuous band (also called "sleeve band"), air scrapers [doctor knives] or application rollers are conventionally used. However, the continuous band has advantages, particularly in the case of plastic films (for example, polypropylene films, etc.) having a thickness of 50-500 μm.

[0004]

However, such continuous bands, which generally are made of metal, have a relatively short life cycle and as a rule they have to be replaced after a few weeks because of signs of wear, in particular cracks in the marginal area. However, replacing the continuous band is expensive because, in the known devices, one has to remove the attachment housing of the roller bearings provided for rotatably attaching the bending rollers. Accordingly, considerable down-time is needed for replacing the band.

[0005]

The objective of the invention now is to provide a device of the type indicated in the introduction, where the continuous band can be replaced in a simple and rapid manner, thus reducing the down-time of the roll frame. In addition, a method is provided for the same purpose, of the type indicated in the introduction.

[0006]

This objective is achieved by means of a device of the type indicated in the introduction, where attachment means are provided for fixing the bending rollers in a bearing device, with the other bearing device, for replacing the continuous band, being attached in a manner that allows swiveling. Using such a device, the bending rollers can thus be attached first in one bearing device; afterwards, one can also swivel the other bearing device to replace the continuous band, while the bending rollers with free projecting ends are held in the other bearing device. After replacing the continuous band, the bearing device that had been swiveled out is swiveled back, and the attachment means for fixing the bending rollers in the other bearing device are again

loosened. The result is a substantially simplified replacement of the continuous band in comparison to known devices. Accordingly, the down-time of the roll frame in which such a device is used is considerably reduced.

[0007]

If, as an attachment means for fixing the bending rollers, a fixation ring is provided in each case, having a conical surface, then the bending rollers can be fixed by a simple shifting of the fixation ring in the direction of a bearing housing that surrounds the bearings of the bending roller, because a frictional connection is achieved between the conical surface of the fixation ring and the bearing housing of the bending roller.

[0008]

During the swiveling of the bearing device, to avoid any conflict with provided fluid lines connected to the bending rollers, for example, to cool them, it is advantageous to provide the fixation ring on a side of the device that has connections for a liquid or gaseous medium, in particular a cooling medium.

[0009]

If the device is attached in a bearing that allows swiveling about an essentially vertical axis of rotation, the bearing device can be swiveled laterally in a simple manner about an axis of rotation that is vertical in the attached position, and thus the continuous band can be replaced without obstacles. In this context, it is particularly advantageous if the bearing device is attached so that it can be swiveled by 90°, because such an arrangement also allows unimpeded access to the bending rollers attached in the other bearing device, even if the widths of the continuous bands are very large. However, the swiveling can also occur over another angular range.

[0010]

An embodiment with a particularly simple design of the arrangement of a bearing device, which allows swiveling for the replacement of the continuous band, is achieved if a centering bolt that extends downward from the bearing device is provided for a bearing attachment that allows a swivel motion, where the centering bolt is rotatably connected in a corresponding opening of a reception plate.

[0011]

To allow the connection of the device to a roll frame in a modular manner, it is advantageous for the device to be on a carriage having several wheels.

[0012]

If the bearing device that can be swiveled has conical recesses to receive conical bearing houses of the bending roller, the bearing sleeves of the rollers can be inserted in a simple manner into the recesses in the bearing device that can be swiveled; in addition, an automatic centering of the positive-lock and/or frictional connection is achieved, because of the conical design of the recess and the bearing housing.

[0013]

To be able to adjust the tension of the continuous band, and in particular the tension of the continuous band prior to replacing the band, it is advantageous to arrange at least one bending roller in a such a manner that the bearing devices can be adjusted. In this context, it is particularly advantageous to provide a pneumatic or hydraulic cylinder for the adjustment of the roller position.

[0014]

As an alternative, an electromotor with a spindle drive can also be used for adjusting the roller position.

[0015]

For the precise orientation of the continuous band with respect to the roller against which the plastic film to be manufactured is pressed, it is advantageous to arrange a frame that carries the two bearing devices in such a manner that it can be adjusted horizontally and vertically.

[0016]

At least one of the bending rollers can be driven by a motor, for example, an electromotor.

[0017]

The method according to the invention, which is of the type indicated in the introduction, is characterized in that the bending rollers are fixed in a bearing device, the attachment means of the other bearing device are loosened, and the other bearing device is swiveled so that the continuous band can be pulled off laterally from the bending rollers.

[0018]

Like the above-described device, this device substantially reduces the time required to replace a continuous band because of signs of wear and aging, since no separate bearing housing shells have to be uninstalled.

[0019]

To be able to remove the continuous band in a particularly simple manner from the two bending rollers and to insert a new continuous band, it is advantageous to reduce the separation between the bending rollers before swiveling the bearing device, because the band tension of the old band has to be reduced before removal; also, for the insertion, the continuous band must not be under tension.

[0020]

If the bending rollers in the bearing device are fixed by means of a fixation ring having a conical surface, then, by diagonally bracing the conical surfaces, the bending rollers can be rigidly attached in a bearing device in a simple manner, between the roller and the bearing housing surrounding the roller; at the same time, they can be centered.

[0021]

To allow a convenient swiveling of the bearing device, which, in a swiveled position, allows unimpeded access to both fixed bending rollers, it is advantageous to swivel the bearing device about an axis that is essentially vertical with respect to a reception plate. In this context, it is particularly advantageous for an unimpeded replacement of the continuous band to swivel the bearing device by 90°.

[0022]

The invention is further explained below with reference to a preferred embodiment example that is represented in the drawings, although the invention is not limited to the latter example.

[0023]

In the detail views of the drawings, the figures show:

Figure 1: a side view of a device for use in a roll frame with a bearing device that can be swiveled;

Figure 2: a view of the device according to Figure 1;

Figure 3: a cross section along the line III-III in Figure 1;

Figure 4: a top view of the device according to Figure 1;

Figure 5: a top view of the device similar to Figure 4, but with the bearing device in the swiveled position;

Figure 6: a detail view of the bearing, that can be swiveled, of a bearing device; and

Figure 7: a view of the device in the state where it is incorporated in a roll frame.

[0024]

Figures 1 and 2 show a device 1 used in a roll frame 10 (see Figure 7) for the manufacture of plastic films for pressing the plastic film on a roller 9 and for cooling the plastic film. In particular, it can be used in a smoothing installation for pressing the plastic film on a cooling roller and for cooling it. For this purpose, a continuous band or sleeve band 2 is provided, which is looped around two bending rollers 3, 3'. The bending rollers 3, 3' do not have to be driven; or the upper bending roller 3 or the lower bending roller 3' can be driven by a motor 4. However, to increase the production rate and to improve the film quality, it is also possible to drive both bending rollers 3, 3' by a motor 4. The bending rollers 3, 3' are rotatably attached on both sides in the bearing devices 5, 5' by means of roller bearings 26 (see Figure 3).

[0025]

The two bearing devices 5, 5' are provided in frame 6, which can be shifted horizontally or vertically with the use of the cylinders 7, 8 to achieve the desired orientation of the continuous band 2 with respect to the roller 9 of the roll frame 10, in which the device 1 is used (see Figure 7).

[0026]

To be able to connect the device 1 in a modular manner to the roll frame 10, it is arranged in such a manner that it can be shifted on a carriage 11 with several wheels 12.

[0027]

To be able to swivel a bearing device 5 from its position shown in Figure 2, in which it receives the bending rollers 3, 3' in a replacement position that has preferably been swiveled by 90°, the bearing device has a centering bolt 13 or similar part that is rotatably attached in an opening 27 (see detail in Figure 6) of a reception plate 28.

[0028]

Figure 3 in particular shows that, in each case, for the fixation of the bending rollers 3, 3', a fixation ring 15 is attached in such a manner that it can be shifted on a shaft axle 14, where the fixation ring, which has a conical surface 16 that tapers toward its free end rigidly connects the

shaft axle 14 or the bending rollers 3, 3', respectively, with the bearing device 5, while simultaneous centering, when a shift occurs in the direction of a bearing sleeve 18 connected by a torque-proof connection to a bearing housing 17.

[0029]

After the bending rollers 3, 3' have thus been statically attached, the pivot bearing device 5' can be swiveled, after the attachment screws 19 have been loosened. For automatic centering when the bearing device 5' swivels back, the latter device has, on its internal side, recesses 20 that broaden conically toward the internal side and that receive the bearing housings 17' that conically taper toward the free end of the bending rollers 3, 3', with positive locking.

[0030]

To allow an unimpeded swiveling of the bearing device 5', the latter is arranged on a side that is turned away from connections 21 for a liquid or gaseous medium.

[0031]

In the top view shown in Figure 4, one can also see the centering bolt 13, about which the entire bearing device 5' can be swiveled in a particularly simple manner after the loosening of the attachment screws 19, 19', as can be seen in particular in Figure 5. After swiveling the bearing device 5' by 90° into the position shown in Figure 5, unimpeded access to the bending rollers 3, 3', which are fixed in the bearing device 5 by means of fixation rings 15, becomes possible. Thus it is possible to carry out the replacement of the continuous band 2 in a simple manner, where such replacement may be required because of signs of wear or other surface-quality factors or surface requirements.

[0032]

To replace the continuous band 2, it is particularly advantageous for the bending rollers 3, 3' to be brought closer to each other, resulting in a decrease in the band tension of the continuous band 2, and thus allowing a particularly simple pulling off from the bending rollers 3, 3'. In the embodiment examples shown in the drawings, the lower bending roller 3' is consequently arranged in the frame 6 on a guide rail or a slide track in such a manner that it can be shifted.

[0033]

As a result of the design with conical tapering of the bearing sleeves 17' toward the free ends, an automatically centering orientation of the bending rollers 3, 3' in the recesses 20 (see Figure 3) of the bearing devices 5' occurs when the bearing device 5' is swiveled back.

[0034]

Figure 6 shows a detail of the attachment of the bearing device 5', which can be swiveled, where such attachment occurs by means of a centering bolt 13 that is rotatably attached in the opening 27 of a reception plate 28 of the carriage 11. The centering bolt 13 is here connected by a torque-proof connection to a bottom plate 22 of the bearing device 5' by means of screws 23. In addition, the centering bolt 13 is led through an opening in a guide plate 24 to achieve a stable pivot bearing.

[0035]

Figure 7 shows the use of a device 1 as shown in Figures 1-5 in a roll frame 10, where the continuous band 2 can be replaced after the cylinder 25 has been shifted in a retracted position, and thus the continuous band 2 is at a distance from the roller 9. Thus, it is not necessary to remove the carriage 11 from the roll frame 10 to replace the continuous band 2.

Claims

1. Device (1) for use in a roll frame (10) for the manufacture of a plastic film, with a continuous band (2), which is looped around at least two bending rollers (3, 3'), for pressing the plastic film on a roller (9) of the roll frame (10) and for cooling the latter [sic; it], where the two bending rollers (3, 3') are rotatably attached on both sides in lateral bearing devices (5, 5'), characterized in that, for the fixation of the bending rollers (3, 3') in a bearing device (5), attachment means are provided, with the other bearing device (5') for the replacement of the continuous band (2) being attached in such a manner that it can be swiveled.

2. Device according to Claim 1, characterized in that, as an attachment means for the fixation of the bending rollers (3, 3'), in each case, a fixation ring (15) is provided, which has a conical surface (16).

3. Device according to Claim 1 or 2, characterized in that the fixation rings (15) are provided on a side of the device (1) having connections (21) for a liquid or gaseous medium.

4. Device according to one of Claims 1-3, characterized in that the bearing device (5') is attached so that it can be swiveled about an essentially vertical axis of rotation.

5. Device according to Claim 4, characterized in that the bearing device (5') is attached so that it can be swiveled by 90°.

6. Device according to one of Claims 1-5, characterized in that, to allow the attachment that allows swiveling, a centering bolt (13), which extends downward from the bearing device (5'), is provided, and is rotatably attached in a corresponding opening (27) in a reception plate (28).

7. Device according to one of Claims 1-6, characterized in that the device (1) is provided on a carriage (11) having several wheels (12).

8. Device according to one of Claims 1-7, characterized in that the bearing device (5') that can be swiveled has conical recesses for receiving conical bearing housings (17') of the bending rollers (3, 3').

9. Device according to one of Claims 1-8, characterized in that at least one bending roller (3, 3') in the bearing devices (5, 5') is arranged so that it can be adjusted.

10. Device according to Claim 9, characterized in that a pneumatic or hydraulic cylinder is provided for the adjustment of the roller position,.

11. Device according to Claim 9, characterized in that an electromotor with a spindle drive is provided for the adjustment of the roller position.

12. Device according to one of Claims 1-11, characterized in that a frame (6) that carries the two bearing devices (5) is arranged in such a manner that it can be adjusted horizontally and vertically.

13. Device according to one of Claims 1-12, characterized in that at least one bending roller (3, 3') is driven by a motor (4).

14. Method for the replacement of a continuous band (2) for pressing a plastic film on a roller (9) and for cooling it, with such a band being looped around at least two bending rollers (3, 3') that are rotatably attached in lateral bearing devices (5, 5'), characterized in that the bending rollers (3, 3') are attached in a bearing device (5), the attachment means of the other bearing device (5') are loosened, and the other bearing device (5') is swiveled, so that the continuous band (2) can be pulled off laterally.

15. Method according to Claim 14, characterized in that the mutual separation of the bending rollers (3, 3') is decreased prior to the swiveling of the bearing device (5').

16. Method according to Claim 14 or 15, characterized in that the bending rollers (3, 3') are fixed in the bearing device (5), in each case, by means of a fixation ring (15) having a conical surface (16).

17. Method according to one of Claims 14-16, characterized in that the bearing device (5') is swiveled about an axis that is essentially vertical to a reception plate (28).

18. Method according to Claim 17, characterized in that the bearing device (5') is swiveled by 90°.

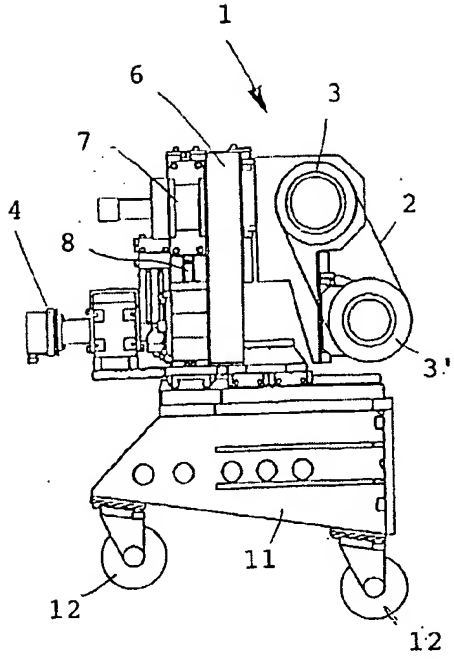

Figure 1

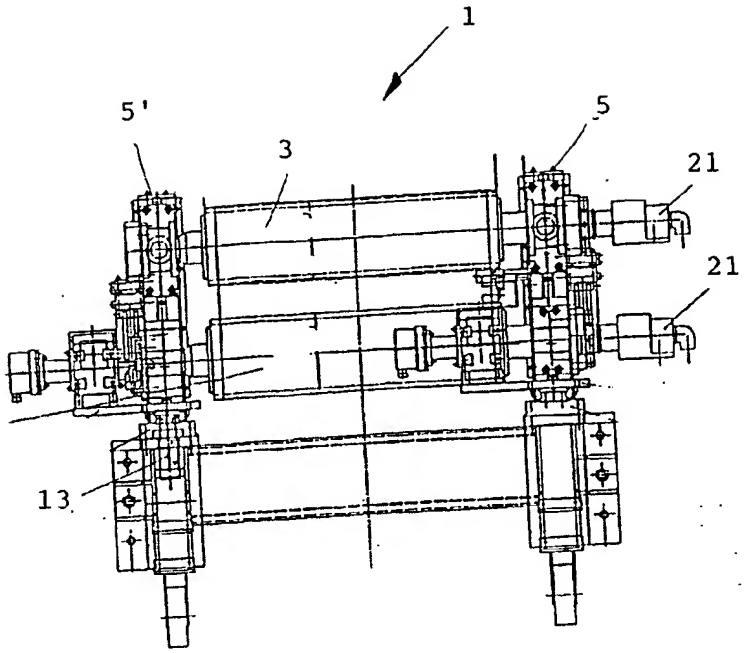

Figure 2

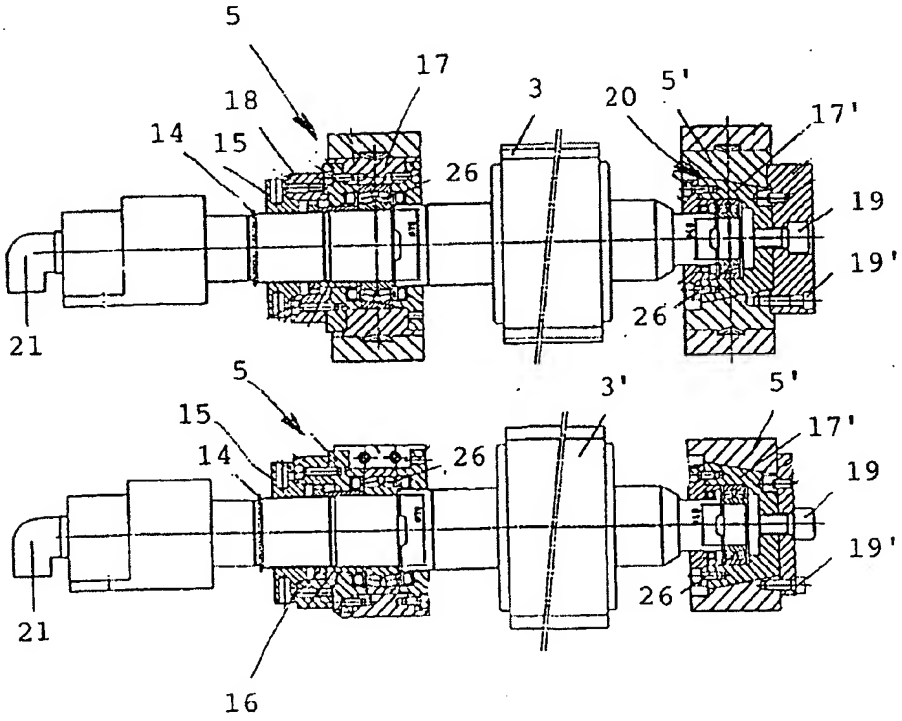

Figure 3

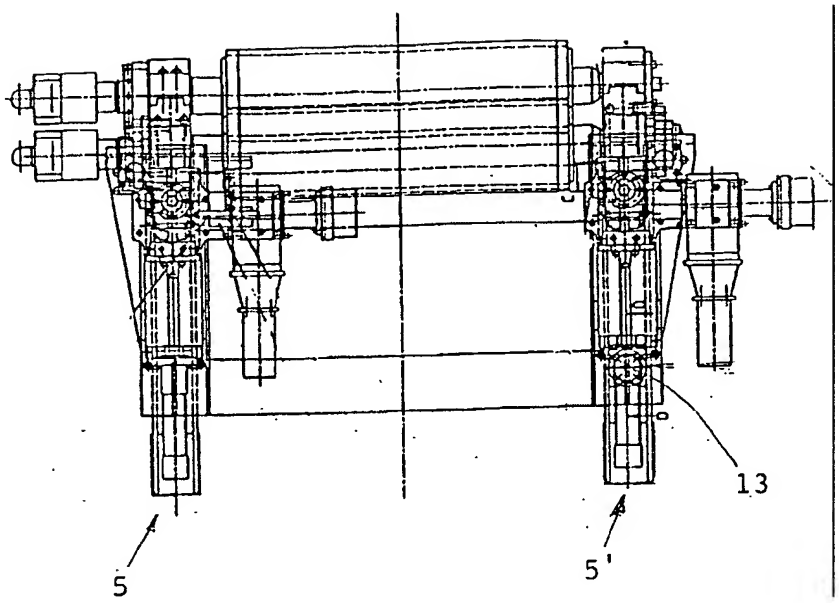

Figure 4

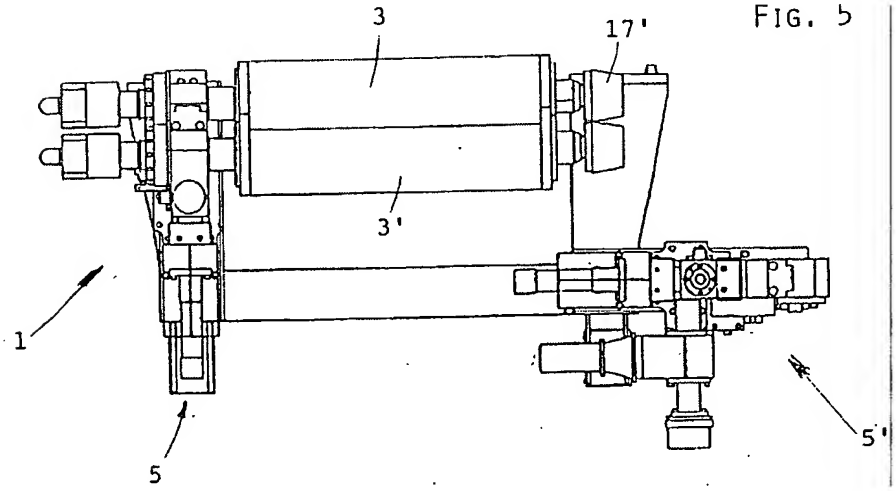

Figure 5

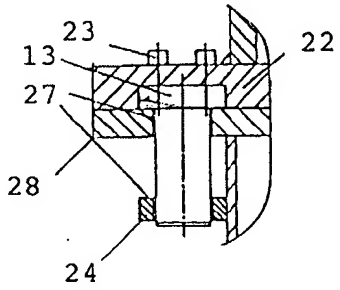

Figure 6

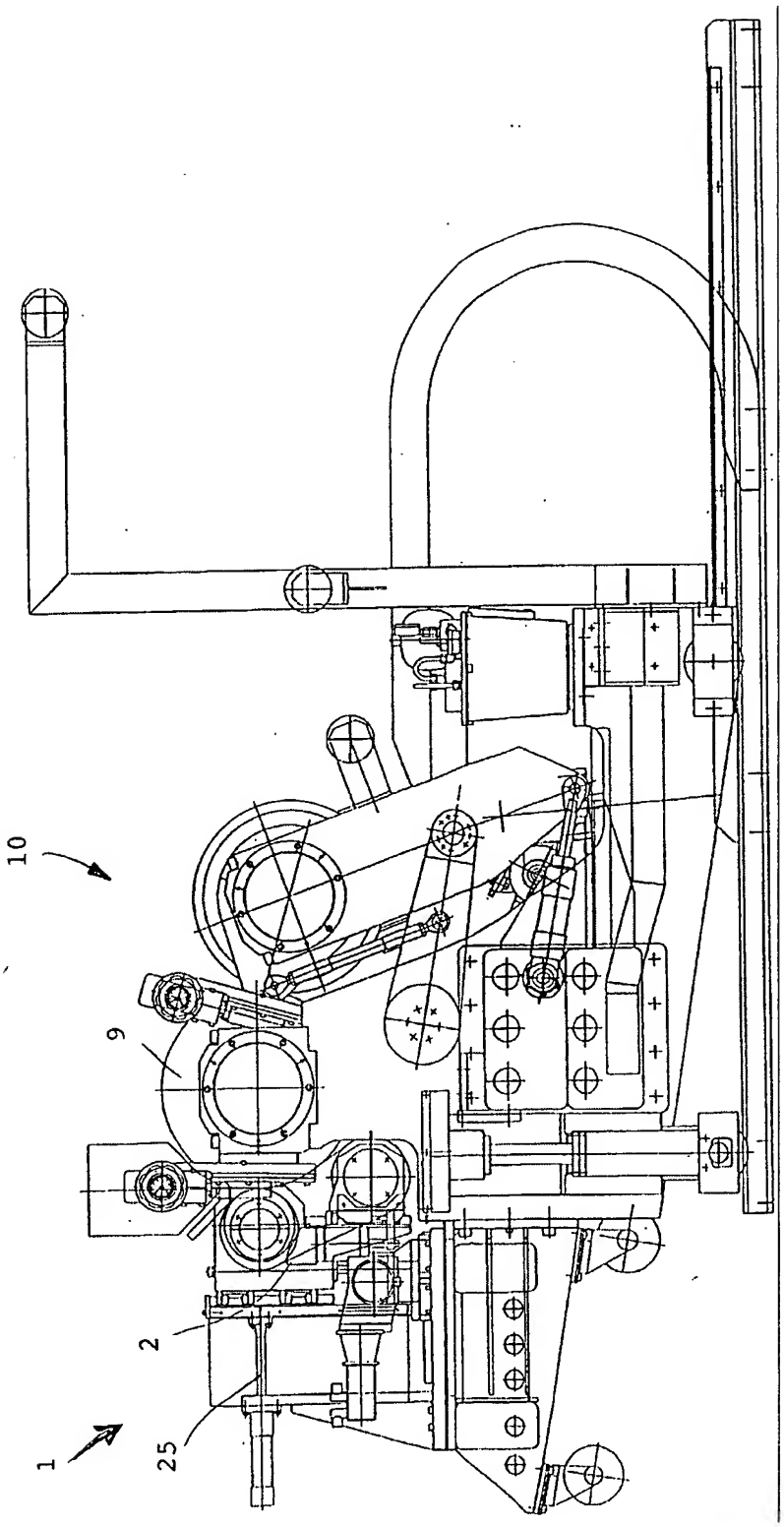

Figure 7

European Patent Office

Application Number EP 01 89 0228

EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl7)
D,A	US 6 077 065 A (SUMIYOSHI KOJI ET AL) June 20, 2000 (2000-06-20) * Column 1, line 35 – column 2, line 8 * ---	1-18	B29C47/88 B29C33/04
A	EP 0 838 321 A (IDEMITSU PETROCHEMICAL CO) April 29, 1998 (1998-04-29) * Page 6, line 54 – page 8, line 8; Figure 1 * ---	1-18	
A	US 5 674 442 A (MORITA KEITA) October 7, 1997 (1997-10-07) * Column 3, line 53 – column 5, line 32; Figure 1 * ---	1-18	
A	WO 99 12722 A (MIKKELSEN OEYSTEIN) March 18, 1999 (1999-03-18) * Abstract; Figures 3, 4 * -----	1-18	TECHNICAL FIELDS SEARCHED (Int. Cl.7) B29C F28F
The present search report has been drawn up for all claims.			

Place of search	Date of completion of the search	Examiner
MUNICH	November 26, 2001	Lanz, P

CATEGORY OF CITED DOCUMENTS

X: Particularly relevant if taken alone.
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A: Technological background.
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L: Document cited for other reasons.

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&: Member of the same patent family, corresponding document.

APPENDIX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 01 89 0228

In this appendix, the patent family members of patent documents listed in the above-referenced European Search Report are indicated.

The data on the family members correspond to the state of the files of the European Patent Office on November 26, 2001

These data serve only for information and are given without guarantee

Patent document listed in the search report	Date of publication	Member(s) of the patent family	Date of publication
US 6077065 A	20-06-2000	JP 10236704 A	08-09-1998
		EP 0861715 A2	02-09-1998
		JP 11179789 A	06-07-1999
EP 0838321 A	29-04-1998	CA 2218970 A1	22-04-1998
		CN 1184732 A	17-06-1998
		EP 0838321 A2	29-04-1998
		JP 11156921 A	15-06-1999
		JP 10211646 A	11-08-1998
US 5674442 A	07-10-1997	WO 9518004 A1	06-07-1995
		EP 0687545 A1	20-12-1995
		JP 6166089 A	14-06-1994
		KR 262478 B1	01-08-2000
WO 9912722 A	18-03-1999	AU 9309198 A	29-03-1999
		WO 9912722 A1	18-03-1999

For additional details regarding this Appendix: see Official Journal of the European Patent Office No. 12/82